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10/606,750

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Naohiro Toda

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EXAMINER

NOTE, JANIS L

ART UNIT

PAPER NUMBER

1795

NOTIFICATION DATE

DELIVERY MODE

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ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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|------------------------------|--------------------------------------|------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/606,750 | <b>Applicant(s)</b><br>TODA ET AL. |  |
|                              | <b>Examiner</b><br>Janis L. Dote     | <b>Art Unit</b><br>1795            |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 December 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 7-26, 28, 33, 34, 36, 37 and 39 is/are pending in the application.
- 4a) Of the above claim(s) 24-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-23, 28, 33, 34 and 37 is/are rejected.
- 7) ☒ Claim(s) 36 and 39 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

1. The examiner acknowledges the amendments to claims 28 and 33 and the cancellation of claims 35 and 38 filed on Dec. 10, 2008. Claims 7-26, 28, 33, 34, 36, 37, and 39 are pending.

2. Claims 24-26 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicants timely traversed the restriction (election) requirement in the reply filed on Nov. 23, 2005.

Applicants are reminded that if the product claims are found to be allowable, pursuant to the procedures set forth in the Official Gazette notice dated March 26, 1996 (1184 O.G. 86), process claims 24-26, which do not depend from or otherwise include all the limitations of the allowable product, will NOT be rejoined.

3. The terminal disclaimer filed on Dec. 10, 2008, disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US Patent No. 7,354,686 has been reviewed and is accepted. The terminal disclaimer has been recorded.

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Accordingly, the rejection of claims 7-22, 28, and 33-39 under the judicially created doctrine of obviousness-type double patenting over claims 1-22 of US 7,354,686 B2 (Toda), set forth in the office action mailed on Aug. 14, 2008, paragraph 17, has been withdrawn.

4. The instant specification at page 12, lines 14-21, discloses that the term "surface roughness" recited in the instant claims "means the ten point mean roughness which can be measured by a method based on JIS B0601. Specifically, the roughness is represented by the difference between the average height of the five projected portions and the average depth of the five recessed portions in a unit length."

5. Claim 33 is objected to because of the following informalities:

The noun/verb number mismatch in the phrase "the polyvinyl acetal resins [sic] has a polymerization degree of from 500 to 5000 and a content of hydroxyl groups of from 25 to 40% by mole" (emphasis added).

Appropriate correction is required.

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 7, 8, 10-14, 16-20, 22, 23, 28, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2002/0076633 A1 (Niimi'633), as evidenced by applicants' admission at page 87, lines 22-23, of the instant specification (applicants' admission I) and by the ACS File Registry RN 26201-32-1, combined with: (1) US 5,871,875 (Chambers); (2) US 4,865,934 (Ueda), as evidenced by Sekisui Corporation Product Information Sheet, copyright 2008, at [http://www.sekisui.co.jp/cs/eng/products/type/slecbk/doc/1183754\\_5124.html](http://www.sekisui.co.jp/cs/eng/products/type/slecbk/doc/1183754_5124.html) (Sekisui Product Information Sheet); (3) US 5,776,650 (Hashimoto); and (4) (3) US 6,623,899 B2 (Takaya).

Niimi'633 discloses an electrophotographic photoreceptor comprising an aluminum drum as the electroconductive substrate; an undercoat layer; a charge generation layer; a charge transport layer formed on the charge generation layer using a halogen-free solvent, and a protective layer. The charge generation layer comprises a polyvinyl butyral resin and a bisazo charge generation material. The charge transport layer is obtained by coating the charge generation layer with a coating solution comprising a binder resin, a charge transport

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compound, and the solvent tetrahydrofuran. The protective layer comprises a charge transport polymer comprising a triarylamine moiety in a main chain and particulate alumina filler having a specific resistivity of  $2.5 \times 10^{12} \Omega \cdot m$ . See refining example 6 at pages 24-25, paragraphs 0346-0351; pages 25-26, paragraphs 0358 to 0367; and example 6 at page 27, paragraphs 0380-0381. The Niimi'633 charge transport layer meets the charge transport layer limitations recited in instant claims 16 and 28. The protective layer in example 6 meets the protective layer limitations recited in instant claims 10-12 and 14.

Niimi'633 does not teach the problems of using chlorinated solvents. However, it is well known in the electrophotographic arts that the use of chlorinated solvents has environmental safety problems. See Chambers, col. 2, lines 14-21. According to Chambers, chlorinated solvents, such as dichloroethane, monochlorobenzene, and methylene chloride, provide charge transport layers having good coating quality. However, Chambers discloses that "chlorinated solvents have environmental safety problems . . . the use of these solvents requires solvent abatement systems in order to eliminate leakage. Therefore, non-chlorinated solvent systems that provide coating qualities

similar to or better than those of chlorinated solvent systems are desired."

Niimi'633 also does not identify its alumina filler as a "α-alumina" as recited in instant claim 13. However, as discussed supra, the Niimi'633 alumina filler has a specific resistivity of  $2.5 \times 10^{12} \Omega \cdot m$ . The instant specification discloses a "α-alumina" having a specific resistivity of  $2.5 \times 10^{12} \Omega \cdot m$ . Instant specification, page 87, lines 22-23. Because the Niimi'633 alumina filler has the same specific resistivity as the "α-alumina" disclosed in the instant specification and is used for the same purpose as a filler in a protective layer for a photoreceptor, it is reasonable to presume that the Niimi'633 alumina filler is an "α-alumina" as recited in instant claim 13. The burden is on applicants to prove otherwise. In re Fitzgerald, 205 USPQ 594 (CCPA 1980).

Niimi'633 further discloses that its photoreceptor may be used as the photoreceptor in an image forming apparatus or a process cartridge. The image forming apparatus comprises at least one image forming unit, which comprises a photoreceptor **1**, a charger **8**, a light irradiator "**5** [sic: **10** in Fig. 3]," an image developer **11**, and a transfer device **15**. Page 4, paragraph 0061; Fig. 3; and page 21, paragraphs 0300-0305. Niimi'633 teaches that the light irradiator is preferably a

laser diode or a light emitting diode as recited in instant claim 19, and that the charger is preferably a contact charger or a proximity charger as recited in instant claims 20 and 22. Page 4, paragraph 0062; and page 21, paragraph 0304. Niimi'633 further teaches that the image forming apparatus can comprise a plurality of image forming units. See Fig. 7, and pages 22-23, paragraphs 0321-0324. The Niimi'633 process cartridge comprises a photoreceptor **43**, and at least one of a charger **40**, an image irradiator **41**, or an image developer **45**. Page 5, paragraph 0063; Fig. 5; and page 22, paragraph 0319.

Niimi'633 further teaches that the charge generation material in the charge generation layer can preferably be a titanyl phthalocyanine pigment having an X-ray diffraction spectrum in which a highest peak is observed at Bragg  $2\theta$  angle of  $27.2^\circ \pm 0.2^\circ$  when a specific X-ray of Cu-K $\alpha$  having a wavelength of 1.541 Å irradiates the titanyl phthalocyanine pigment. Paragraph 0151 and example 28 at page 32, paragraph 0476. In example 28, the exemplified charge generation layer comprises a titanyl phthalocyanine pigment having the X-ray diffraction spectrum shown in Fig. 6 and a polyvinyl butyral binder resin. The diffraction spectrum in Fig. 6 further has a lowest angle peak at  $7.4^\circ$ , peaks at  $9.5^\circ$ ,  $9.7^\circ$ , and  $23.5^\circ$ , and no peak at  $26.3^\circ$ . See Fig. 6. The



locations of the peaks at  $7.4^\circ$ ,  $9.5^\circ$ ,  $9.7^\circ$ , and  $23.5^\circ$  were determined by measuring the positions of the peaks with a ruler and correlating the positions with the x-axis in Fig. 6.

Niimi'633 does not explicitly identify the chemical structure of its titanyl phthalocyanine. However, as evidenced by the ACS File Registry RN 26201-32-1, it is well known that titanyl phthalocyanine has a chemical structure that is within the compositional limitations of formula (1) recited in instant claim 28, when the indexes m, n, j, and k are 0.

Nimi'633 also does not disclose that its titanyl phthalocyanine has the X-ray diffraction spectrum according to Figure 13, when a Cu-K $\alpha$  X-ray having a wavelength of 1.542 Å is used, as recited in instant claim 28. As discussed supra, the Niimi'633 X-ray diffraction spectrum is obtained using a Cu-K $\alpha$  X-ray having a wavelength of 1.541 Å, not 1.542 Å, as recited in instant claim 28. However, the peaks at the Bragg angles in the X-ray diffraction spectrum in Fig. 6 of Niimi'633 are within the scope of the spectrum in Figure 13 recited in instant claim 28. The Niimi'633 spectrum in Fig. 6 appears to be identical to that shown in Figure 13 of instant claim 28. The differences, if any, between the Niimi'633 spectrum in Fig. 6 and the spectrum in Figure 13 recited in instant claim 28, appear to be artifacts that may be attributed to how the diffraction spectra were

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obtained or to data manipulation, e.g., using a smoothing method to remove the noise in the spectrum. Thus, it is reasonable to presume that the Niimi'633 titanyl phthalocyanine has an X-ray diffraction spectrum that meets the X-ray diffraction spectrum in Figure 13, when a Cu-K $\alpha$  X-ray having a wavelength of 1.542 Å is used, as recited in instant claim 28. The burden is on applicants to prove otherwise. Fitzgerald, supra.

Niimi'633 does not exemplify a charge generation layer comprising a polyvinyl acetal as recited in instant claim 28. Nor does Niimi'633 exemplify a charge generation layer coating solution comprising its titanyl phthalocyanine pigment having an average particle diameter as recited in the instant claims. However, as discussed above, Niimi'633 exemplifies a charge generation layer comprising its titanyl phthalocyanine and a polyvinyl butyral binder resin. See example 28 at paragraph 0476. Niimi'633 teaches that the charge generation layer is prepared by mixing the charge generation material with a proper solvent and binder resin and dispersing the mixture with "a ball mill . . . to prepare a coating liquid."

Paragraphs 0154-0157.

Ueda teaches that it is preferred to use a polyvinyl butyral resin having a polymerization degree of 500 to 2000, a butylation degree of 50-80 mole percent, and an acetylation

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degree of 0 to 5 mole percent as the binder resin in a charge generation layer. Col. 6, lines 32-38. According to Ueda, the use of a polyvinylbutyral resin not having the butylation degree, acetylation degree, and polymerization degree described above as the binder resin in a charge generation layer "brings about such problems as bad dispersibility, increment of dark decay of surface potential and deterioration of repeating problems and sensitivity." Col. 6, lines 38-42. Ueda further teaches that the polyvinyl butyral resin sold under the tradename S-LEC BX-1, manufactured by Sekisui Kagaku Kogyo K.K., meets the requirements of the preferred polyvinyl butyral resin. The polyvinyl butyral resin sold under the tradename S-LEC BX-1 has an acetylation degree of 3 mole% or less, a butylation degree of 55 mole%, and a polymerization degree of 1100. Col. 15, lines 4-7. The polymerization degree of 1100 is within the polymerization degree range of 500 to 5000 recited in instant claim 28. According to the Sekisui Corporation Product Information Sheet, the polyvinyl butyral resin sold under the tradename S-LEC BX-1 also has a hydroxyl content of  $33 \pm 3$  mole%, which is within the hydroxyl content of 25 to 40% by mole recited in instant claim 28.

Hashimoto teaches a method of preparing a charge generation dispersion liquid for forming a charge generation layer

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comprising the step of dispersing a charge generation pigment or dye and a binder resin with a ball-shaped pulverizing media in a dispersing solvent to an average particle size of about 0.1 to 0.3  $\mu\text{m}$ . Col. 2, lines 52-68. Hashimoto exemplifies forming charge generation layers with said charge generation dispersion liquid where the average particle size of the organic pigment or dye dispersoids is either 0.15  $\mu\text{m}$  or 0.18  $\mu\text{m}$ . See the first and second embodiments at col. 6, line 33-64, and col. 7, lines 26-30, respectively, and in Table 1 at col. 8. The average particle sizes of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15  $\mu\text{m}$  or 0.18  $\mu\text{m}$ , are within the particle diameter limitation of "not greater than 0.3  $\mu\text{m}$ " recited in instant claim 28. Hashimoto teaches that the charge generation pigments or dyes "are not specifically limited as far as the pigments or the dyes may function as a charge generating agent in a charge generation layer. For example, pigments such as phthalocyanine pigments . . . ." Col. 4, lines 45-50. According to Hashimoto, when the organic pigment or dye is dispersed in a resin binder as taught by Hashimoto to an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , the "pigment or dye dispersoids are prevented from coagulating for a time period long enough to cause no problems in practical use of the dispersion liquid." Col. 4, lines 20-28. Hashimoto teaches that its dispersion liquid "exhibits excellent stability

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of the pigment or dye dispersoids, facilitates manufacturing electro-photographic photoconductors having a charge generation layer which exhibits excellent photographic properties."

Col. 4, lines 29-33. The photoconductor also has improved stability. Col. 2, lines 41-43.

It would have been obvious for a person having ordinary skill in the art, in view of the teachings of Niimi'633, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, to prepare a charge generation dispersion coating solution as taught by Hashimoto comprising the Niimi'633 titanyl phthalocyanine pigment and the commercially available polyvinylbutyral binder resin sold under the tradename S-LEC BX-1 by Sekisui Corp., as taught by Ueda, as the polyvinyl butyral resin, such that the resultant dispersion solution comprises titanyl phthalocyanine pigment dispersoids having an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15 or 0.18  $\mu\text{m}$ . It would have also been obvious for that person, in view of the teachings of Chambers, to use the resultant dispersion solution to form the charge generation layer in the Niimi'633 photoreceptor in example 6 that comprises the charge transport layer formed using tetrahydrofuran. That person would have had a reasonable expectation of successfully obtaining an electrophotographic photoreceptor, an image forming apparatus,

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and a process cartridge without the use of environmentally problematic chlorinated solvents, all of which have improved stability and excellent photoconductive properties as taught by Hashimoto, and all of which avoid problems such as bad dispersibility, increment of dark decay of surface potential and deterioration of repeating problems and sensitivity disclosed by Ueda.

Instant claim 7 is written in product-by-process format. The combined teachings of Niimi'633, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, do not disclose that the charge generation layer is formed by the method recited in the instant claim 7. However, as discussed above, the combined teachings of Niimi'633, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, render obvious a titanyl phthalocyanine pigment having an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15  $\mu\text{m}$  or 0.18  $\mu\text{m}$ . The average particle sizes of 0.15 or 0.18  $\mu\text{m}$  meet the average particle size limitation of "not greater than 0.3  $\mu\text{m}$ " recited in instant claim 7. Because the average particle size of 0.15 or 0.18  $\mu\text{m}$  is much smaller than the average particle size limitation of not greater than 0.3  $\mu\text{m}$  recited in instant claim 7, it is reasonable to conclude that the average particle

size of 0.15 or 0.18  $\mu\text{m}$  meets the particle size standard deviation of "not greater than 0.2  $\mu\text{m}$ " recited in instant claim 7. Thus, it appears that the charge generation layer rendered obvious over the combined teachings of Niimi'633, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, is the same or substantially the same as the instantly recited charge generation layer made by the process recited in instant claim 7. The burden is on applicants to prove otherwise. In re Marosi, 218 USPQ 289 (Fed. Cir. 1983); In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985); MPEP 2113.

Instant claim 8 is written in product-by-process format. Niimi'633 does not disclose that its titanyl phthalocyanine material is obtained by the method recited in instant claim 8. However, the Niimi'633 titanyl phthalocyanine pigment exhibits an X-ray diffraction spectrum that meets the spectrum in Figure 13 recited in instant claim 28. The titanyl phthalocyanine pigment average particle size of 0.15  $\mu\text{m}$  or 0.18  $\mu\text{m}$  rendered obvious over the combined teachings of Niimi'633, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, meets the particle size limitation of "not greater than 0.3  $\mu\text{m}$ " recited in instant claim 28. Therefore, it appears that the titanyl phthalocyanine pigment rendered obvious over the combined teachings of Niimi'633,

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Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, is the same or substantially the same as the instantly recited titanyl phthalocyanine crystal made by the process steps recited in the instant claim. The burden is on applicants to prove otherwise. Marosi; Thorpe; MPEP 2113.

Niimi'633 also does not exemplify a photoreceptor comprising an undercoat layer having the surface roughness as recited in the instant claims. However, Niimi'633 does not limit the type of undercoat layer used. Page 12, paragraph 0180; and reference claim 22.

Takaya teaches the use of a particular intermediate layer located between the charge generation layer and the electroconductive substrate of an electrophotographic photosensitive member. Takaya discloses that the intermediate layer has a layer thickness of at least 0.5  $\mu\text{m}$  and comprises aggregated particles of  $\text{Al}_2\text{O}_3 \cdot n\text{H}_2\text{O}$ , where  $n$  is a number of at least 0 representing "a degree of hydration." Col. 3, lines 55-63. Takaya teaches that the intermediate layer preferably has a 10-point surface roughness  $R_z$  (according to JIS B06010) of "0.1 to 1  $\mu\text{m}$  so as to provide improved function of preventing the occurrence of interference fringes sometimes encountered in an electrophotographic apparatus of a digital scheme using coherent light such as laser light as exposure



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light." Col. 7, lines 1-8. Takaya exemplifies an intermediate layer having a 10-point surface roughness Rz of 0.5  $\mu\text{m}$ . See, for example, example 1, col. 10, lines 13-27. Takaya discloses that its intermediate layer "can be formed in a crack-free state inexpensively and without requiring a special technique by using a coating liquid of a good storage stability." Col. 3, lines 34-37. According to Takaya, prior art intermediate layers comprising a polyamide resin are "liable to have an electrical resistance which is liable to change depending on environmental changes, so that it has been difficult to provide an electrophotographic photosensitive member having stable and excellent potential characteristics in all environments ranging from low temperature/low humidity to high temperature/high humidity." Col. 2, lines 14-27. Takaya discloses that photosensitive members comprising its particular intermediate layer solve the above-mentioned problems of the prior art. Col. 3, lines 27-30. Takaya discloses that such photosensitive members exhibit "excellent potential characteristic and image forming characteristic free from difficulties, such as lower image density or black spots and fog, over a variety of temperature and humidity environment conditions even at a smaller thickness of photosensitive layer." Col. 3,

lines 39-46; example 1, col. 11, lines 12-19; and Table 1 at col. 13, example 1.

When the Takaya intermediate layer is used in the photoreceptor rendered obvious over the combined teachings of Niimi'633, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, the resultant photoreceptor satisfies the surface roughness - particle size relationships recited in instant claim 28. As discussed supra, the titanyl phthalocyanine pigment particles in the charge generation layer rendered obvious over the combined teachings of Niimi'633, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, have an average particle size of 0.15 or 0.18  $\mu\text{m}$ . The average particle sizes of 0.15 and 0.18  $\mu\text{m}$  are smaller than the Takaya undercoat layer 10-point surface roughness of 0.5  $\mu\text{m}$  and are also not greater than 2/3 of the roughness of 0.5  $\mu\text{m}$  (i.e., 0.33  $\mu\text{m}$ ), as recited in instant claim 28.

It would have been obvious for a person having ordinary skill in the art, in view of the teachings in Takaya, to use the undercoat layer taught by Takaya having a 10-point surface roughness  $R_z$  of 0.5  $\mu\text{m}$  as the undercoat layer in the photoreceptor rendered obvious over the combined teachings of Niimi'633, Chambers, Hashimoto, and Ueda, as evidenced by the

Sekisui Product Information Sheet, to use the resultant photoreceptor in the image forming apparatus and process cartridge rendered obvious over the combined teachings of Niimi'633, Chambers, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet. That person would have had a reasonable expectation of successfully obtaining an electrophotographic photoreceptor, an image forming apparatus, and a process cartridge that prevent the occurrence of interference fringes and exhibit excellent potential characteristics and image forming characteristics free from difficulties over a variety of temperature and humidity environment conditions as disclosed by Takaya.

8. Claims 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Niimi'633, as evidenced by applicants' admission I and by the ACS File Registry RN 26201-32-1, combined with: (1) Chambers; (2) Ueda, as evidenced by the Sekisui Product Information Sheet; (3) Hashimoto; and (4) Takaya, as applied to claim 20 above, further combined with US 2002/0051654 A1 (Niimi'654).

The claims are rejected for the reasons discussed in the office action mailed on Oct. 30, 2006, paragraph 11, which are incorporated herein by reference.

9. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Niimi'633, as evidenced by applicants' admission I and by the ACS File Registry RN 26201-32-1, combined with: (1) Chambers; (2) Ueda, as evidenced by the Sekisui Product Information Sheet; (3) Hashimoto; and (4) Takaya, as applied to claim 28 above, further combined with US 4,806,443 (Yanus).

The claim is rejected for the reasons discussed in the office action mailed on Feb. 12, 2008, paragraph 12, which are incorporated herein by reference.

10. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Niimi'633, as evidenced by applicants' admission I and by the ACS File Registry RN 26201-32-1, combined with: (1) Chambers; (2) Ueda, as evidenced by the Sekisui Product Information Sheet; (3) Hashimoto; and (4) Takaya, as applied to claim 28 above, further combined with US 6,080,491 (Takaki).

The claim is rejected for the reasons discussed in the office action mailed on Feb. 12, 2008, paragraph 13, which are incorporated herein by reference.

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11. Claims 7, 8, 10-14, 16-23, 28, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over European Patent 1,205,808 A1 (Tamoto), as evidenced by the ACS File Registry RN 26201-32-1, combined with: (1) Ueda, as evidenced by the Sekisui Product Information Sheet; (2) Hashimoto; and (3) Takaya.

Tamoto discloses electrophotographic photoreceptors comprising an electroconductive substrate; an undercoat layer; a charge generation layer; a charge transport layer formed on the charge generation layer using a halogen-free solvent, and a protective layer. See paragraphs 0361 and 0418, and examples 32 and 35 in paragraphs 0424 and 0430, respectively.

The charge generation layer comprises a titanyl phthalocyanine having the X-ray diffraction spectrum in Fig. 10 and a polyvinyl butyral resin. The layer has a thickness of 0.2  $\mu\text{m}$ . The X-ray diffraction spectrum in Fig. 10 has a maximum peak at a Bragg angle of  $27.2^\circ$ , a lowest angle peak at  $7.3^\circ$ , peaks at  $9.5^\circ$ ,  $9.7^\circ$ , and  $23.5^\circ$ , and no peak at  $26.3^\circ$ . See Fig. 10. The locations of the peaks at angles  $7.3^\circ$ ,  $9.5^\circ$ ,  $9.7^\circ$ ,  $23.5^\circ$ , and  $27.2^\circ$  were determined by measuring the positions of the peaks with a ruler and correlating the positions with the x-axis in Fig. 10.

Tamoto does not explicitly identify the chemical structure of its titanyl phthalocyanine. However, as evidenced by the ACS File Registry RN 26201-32-1, it is well known that titanyl phthalocyanine has a chemical structure that is within the compositional limitations of formula (1) recited in instant claim 28, when the indexes  $m$ ,  $n$ ,  $j$ , and  $k$  are 0.

Tamoto does not disclose that its titanyl phthalocyanine has the X-ray diffraction spectrum according to Figure 13, when a Cu-K $\alpha$  X-ray having a wavelength of 1.542 Å is used, as recited in instant claim 28. However, the peaks at the Bragg angles in the X-ray diffraction spectrum in Fig. 10 of Tamoto are within the scope of the spectrum in Figure 13 recited in instant claim 28. The Tamoto spectrum in Fig. 10 appears to be identical to that shown in Figure 13 of instant claim 28. The differences, if any, between the Tamoto spectrum in Fig. 10 and the spectrum in Figure 13 recited in instant claim 28, appear to be artifacts that may be attributed to how the diffraction spectra were obtained or to data manipulation, e.g., using a smoothing method to remove the noise in the spectrum. Thus, it is reasonable to presume that the Tamoto titanyl phthalocyanine has an X-ray diffraction spectrum that meets the X-ray diffraction spectrum in Figure 13, when a Cu-K $\alpha$  X-ray having a wavelength of 1.542 Å is used, as recited in instant claim 28.

The burden is on applicants to prove otherwise. Fitzgerald,  
supra.

The charge transport layer is obtained by coating the charge generation layer with a coating solution comprising a polycarbonate binder resin, a charge transport compound, and the solvent toluene. In example 32, the protective layer comprises a binder resin, a charge transport compound, and an  $\alpha$ -alumina filler having a resistivity of not less than  $10^{10} \Omega \cdot m$ . In example 35, the protective layer comprises a charge transport polymer comprising a triarylamine moiety in a side chain (formula 14) and an  $\alpha$ -alumina filler. The Tamoto charge transport layer meets the charge transport layer limitations recited in instant claims 16 and 28. The protective layers in examples 32 and 35 meet the protective layer limitations recited in instant claims 10-13 and claims 10 and 14, respectively.

Tamoto further discloses that its photoreceptor may be used as the photoreceptor in an image forming apparatus or a process cartridge. The image forming apparatus comprises at least one image forming unit, which comprises a photoreceptor **1**, a charger **3**, a light irradiator **5**, an image developer **6**, and a transfer device **10**. Paragraphs 0240-0242 and Fig. 6. Tamoto teaches that the light irradiator can be a laser diode or a light emitting diode as recited in instant claim 19.

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Paragraph 0254. According to Tamoto, the charger can be a contact charger or preferably a proximity charger as recited in instant claims 20-22. Paragraphs 0246 and 0248-0249. Tamoto further teaches that the image forming apparatus can comprise a plurality of image forming units. See Fig. 7 and paragraphs 0266-0267. The Tamoto process cartridge comprises a photoreceptor **16**, a charger **17**, an image irradiator **19**, and an image developer **20**. Fig. 9 and paragraph 0277.

Tamoto does not exemplify a charge generation layer comprising a polyvinyl acetal as recited in instant claim 28. Nor does Tamoto exemplify a charge generation layer coating solution comprising its titanyl phthalocyanine pigment having an average particle diameter as recited in the instant claims. However, as discussed supra, Tamoto exemplifies a charge generation layer comprising its titanyl phthalocyanine and polyvinyl butyral resin. See paragraph 0418. Tamoto teaches that the charge generation layer is prepared by mixing the charge generation material with a proper solvent and binder resin and dispersing the mixture with "a ball mill . . . to prepare a coating liquid." Paragraph 0103.

Ueda teaches that it is preferred to use a polyvinyl butyral resin having a polymerization degree of 500 to 2000, a butylation degree of 50-80 mole percent, and an acetylation



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degree of 0 to 5 mole percent as the binder resin in a charge generation layer. Ueda further teaches that the polyvinyl butyral resin sold under the tradename S-LEC BX-1, manufactured by Sekisui Kagaku Kogyo K.K., meets the requirements of the preferred polyvinyl butyral resin. According to Ueda and the Sekisui Product Information Sheet, the polyvinyl butyral resin sold under the tradename S-LEC BX-1 is within the compositional limitations of the polyvinyl acetal resin recited in instant claims 28 and 34. The discussions of Ueda and the Sekisui Product Information Sheet in paragraph 7 above are incorporated herein by reference.

Hashimoto teaches a method of preparing a charge generation dispersion liquid for forming a charge generation layer comprising the step of dispersing a charge generation pigment or dye with a binder resin with a ball-shaped pulverizing media in a dispersing solvent to an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15 or 0.18  $\mu\text{m}$ . The average particle sizes of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15 or 0.18  $\mu\text{m}$ , are within the particle diameter limitation of "not greater than 0.3  $\mu\text{m}$ " recited in instant claim 28. The discussion of Hashimoto in paragraph 7 above is incorporated herein by reference.

It would have been obvious for a person having ordinary skill in the art, in view of the teachings of Tamoto, Hashimoto,

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and Ueda, as evidenced by the Sekisui Product Information Sheet, to prepare a charge generation dispersion coating solution as taught by Hashimoto comprising the Tamoto titanyl phthalocyanine pigment and the commercially available polyvinylbutyral binder resin sold under the tradename S-LEC BX-1 by Sekisui Corp., as taught by Ueda, as the polyvinyl butyral resin, such that the resultant dispersion solution comprises titanyl phthalocyanine pigment dispersoids having an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15 or 0.18  $\mu\text{m}$ , and to use the resultant dispersion solution to form the charge generation layer in the photoreceptors in examples 32 and 35 of Tamoto. That person would have had a reasonable expectation of successfully obtaining an electrophotographic photoreceptor, an image forming apparatus, and a process cartridge that have improved stability and excellent photoconductive properties as taught by Hashimoto, and that further avoid problems, such as bad dispersibility, increment of dark decay of surface potential and deterioration of repeating problems and sensitivity disclosed by Ueda.

Instant claim 7 is written in product-by-process format. The combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, do not disclose that the charge generation layer is formed by the method recited in the instant claim 7. However, as discussed

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above, the combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, render obvious a titanyl phthalocyanine pigment having an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15  $\mu\text{m}$  or 0.18  $\mu\text{m}$ . The average particle sizes of 0.15 or 0.18  $\mu\text{m}$  meet the average particle size limitation of "not greater than 0.3  $\mu\text{m}$ " recited in instant claim 7. Because the average particle size of 0.15 or 0.18  $\mu\text{m}$  is much smaller than the average particle size limitation of not greater than 0.3  $\mu\text{m}$  recited in instant claim 7, it is reasonable to conclude that the average particle size of 0.15 or 0.18  $\mu\text{m}$  meets the particle size standard deviation of "not greater than 0.2  $\mu\text{m}$ " recited in instant claim 7. Thus, it appears that the charge generation layer rendered obvious over the combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, is the same or substantially the same as the instantly recited charge generation layer made by the process recited in instant claim 7. The burden is on applicants to prove otherwise. In re Marosi, 218 USPQ 289 (Fed. Cir. 1983); In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985); MPEP 2113.

Instant claim 8 is written in product-by-process format. Tamoto does not disclose that its titanyl phthalocyanine

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material is obtained by the method recited in instant claim 8. However, the Tamoto titanyl phthalocyanine pigment exhibits an X-ray diffraction spectrum that meets the spectrum in Figure 13 recited in instant claim 28. The titanyl phthalocyanine pigment average particle size of 0.15  $\mu\text{m}$  or 0.18  $\mu\text{m}$  rendered obvious over the combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, meets the particle size limitation of "not greater than 0.3  $\mu\text{m}$ " recited in instant claim 28. Therefore, it appears that the titanyl phthalocyanine pigment rendered obvious over the combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, is the same or substantially the same as the instantly recited titanyl phthalocyanine crystal made by the process steps recited in the instant claim. The burden is on applicants to prove otherwise. Marosi; Thorpe; MPEP 2113.

Tamoto also does not exemplify a photoreceptor comprising an undercoat layer having the surface roughness as recited in the instant claims. However, Tamoto does not limit the type of undercoat layer used. Paragraph 0194.

Takaya teaches the benefits of using of a particular intermediate layer located between the charge generation layer and the electroconductive substrate of an electrophotographic

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photosensitive member, which has a 10-point surface roughness  $R_z$  of  $0.5\text{ }\mu\text{m}$ . The discussion of Takaya in paragraph 7 above is incorporated herein by reference.

When the Takaya intermediate layer is used in the photoreceptor rendered obvious over the combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, the resultant photoreceptor satisfies the surface roughness - particle size relationships recited in instant claim 28. As discussed supra, the titanyl phthalocyanine pigment particles in the charge generation layer rendered obvious over the combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, have an average particle size of  $0.15$  or  $0.18\text{ }\mu\text{m}$ . The average particle sizes of  $0.15$  and  $0.18\text{ }\mu\text{m}$  are smaller than the Takaya undercoat layer 10-point surface roughness of  $0.5\text{ }\mu\text{m}$  and are also not greater than  $2/3$  of the roughness of  $0.5\text{ }\mu\text{m}$  (i.e.,  $0.33\text{ }\mu\text{m}$ ), as recited in instant claim 28.

It would have been obvious for a person having ordinary skill in the art, in view of the teachings in Takaya, to use the undercoat layer taught by Takaya having a 10-point surface roughness  $R_z$  of  $0.5\text{ }\mu\text{m}$  as the undercoat layer in the photoreceptors rendered obvious over the combined teachings of

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Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, and to use the resultant photoreceptor in the image forming apparatus and process cartridge rendered obvious over the combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet. That person would have had a reasonable expectation of successfully obtaining an electrophotographic photoreceptor, an image forming apparatus, and a process cartridge that prevent the occurrence of interference fringes and exhibit excellent potential characteristics and image forming characteristics free from difficulties over a variety of temperature and humidity environment conditions as disclosed by Takaya.

12. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamoto, as evidenced by the ACS File Registry RN 26201-32-1, combined with: (1) Ueda, as evidenced the Sekisui Product Information Sheet; (2) Hashimoto; and (3) Takaya, as applied to claim 28 above, further combined with Yanus.

The claim is rejected for the reasons discussed in the office action mailed on Feb. 12, 2008, paragraph 15, which are incorporated herein by reference.

13. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamoto, as evidenced by the ACS File Registry RN 26201-32-1, combined with (1) Ueda, as evidenced by the Sekisui Product Information Sheet; (2) Hashimoto; and (3) Takaya, as applied to claim 28 above, further combined with Takaki.

The claim is rejected for the reasons discussed in the office action mailed on Feb. 12, 2008, paragraph 16, which are incorporated herein by reference.

14. Applicants' arguments filed on Dec. 10, 2008, as applicable to the rejections set forth in paragraphs 7-13 above, have been fully considered but they are not persuasive.

Applicants assert that none of the cited references in the rejections set forth in paragraphs 7-13 discloses or suggests the photoreceptor as recited in instant claim 28. Applicants further assert that none of references discloses or suggests the advantages sought by applicants.

Applicants' assertions are not persuasive. For the reasons discussed in paragraphs 7 and 11, the combined teachings of the cited references renders obvious electrophotographic photoreceptors that meet all of the compositional limitations, particle size, and surface roughness limitations recited in

instant claim 28. Furthermore, the reasons for combining the references do not have to be those of applicants.

With respect to the rejections over Niimi'633, as discussed in paragraph 7 above, the photoreceptor exemplified in example 6 of Niimi'633 comprises a charge transport layer (CTL) made with the halogen-free solvent tetrahydrofuran. Niimi'633 teaches that the charge generation material used in its charge generation layer (CGL) can be a titanyl phthalocyanine. Niimi'633 also exemplifies such a CGL in example 28. As discussed in paragraph 7 above and admitted by applicants in the response filed on Jul. 12, 2007, page 24, lines 4-5, it is well known that the use of chlorinated solvents, which are halogenated solvents, have environmental safety problems. Thus, for the reasons discussed in paragraph 7 above, it would have been obvious for a person having ordinary skill in the art to use the CGL in example 28 of Niimi'633 as the CGL in the photoreceptor exemplified in example 6 of Niimi'633.

With respect to the rejections over Tamoto, as discussed in paragraph 11 above, Tamoto teaches photoreceptors comprising a CTL formed with the solvent toluene, which is a non-halogenated solvent, and a charge generation layer comprising a titanyl phthalocyanine.



For the reasons discussed in the rejections in paragraphs 7 and 11 above, Ueda, as evidenced by the Sekisui Product Information Sheet, and Hashimoto provide reason, suggestion, and motivation to make and use a charge generation layer coating solution, as taught by Hashimoto, comprising the titanyl phthalocyanine pigment taught by Niimi'633 or Tamoto and a polyvinyl acetal within the compositional limitations recited in instant claim 28, as taught by Ueda, such that the resultant pigment dispersoids have an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , such as 0.15 or 0.18  $\mu\text{m}$ . Takaya also provides reason, suggestion, and motivation to use its intermediate layer as the intermediate layer in the photoreceptors rendered obvious over the combined teachings of Niimi'633, Chambers, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, and over the combined teachings of Tamoto, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet.

Accordingly, the rejections set forth in paragraphs 7-13 stand.

Applicants further assert that the references do not disclose the "superior properties" of the claimed photoreceptors as shown in the examples 2 and 4 of the instant specification and in the Rule 132 declaration, which was executed by Tatsuya Niimi on Dec. 4, 2008, and filed on Dec. 10, 2008.

However, as discussed supra, the reasons for combining the references do not have to be those of applicants. Furthermore, the showings in the instant specification and in the declaration are insufficient to show that the instantly claimed invention yields unexpectedly "superior" results.

(The examiner notes that the descriptions of samples 3 to 5, i.e., labeled Ref. Ex. 5, Ref. Ex. 6, and Comp. Ref. Ex. 1, respectively, in Table 2-(2) in the declaration do not correspond with those in the preparations of samples 3 to 5 at pages 2 to 3 of the declaration. For example, the declaration at page 2 states that in sample 4, the "procedure for preparation of the photoreceptor of Example 2 of the specification of the invention was repeated except that the average particle diameter of the TiOPc pigment . . . was changed to 0.25  $\mu\text{m}$  . . ." In Example 2, the intermediate layer surface roughness is reported to be 0.6  $\mu\text{m}$ . See Table 2(2), Ex. 2. However, Table 2(2) reports that for the photoreceptor in Sample 4, labeled as Ref. Ex. 6, the intermediate layer surface roughness is "0.4  $\mu\text{m}$ ," not 0.6  $\mu\text{m}$ . Because of the conflicting descriptions of samples 3 to 5 in Table 2(2) from the descriptions of said samples at pages 2 to 3 of the declaration, the results for Comp. Ex. 1 and Ref. Exs. 5 and 6 will not be considered.)

The showings in the instant specification, in particular comparative examples 3 and 5, and in the declaration, comparative examples 2 to 5, do not appear to provide a probative comparison to Niimi'633 or Tamoto.

Niimi'633 exemplifies a photoreceptor that exhibits stable charging properties, i.e., residual potential properties, and that provides images with "good" image qualities. See Niimi'633, Table 2 at page 28, example 6. The Niimi'663 photoreceptor comprises an electrically conductive substrate, an intermediate layer, a CGL comprising a particular azo pigment, a CTL formed using THF, and a particular protective layer.

Tamoto exemplifies photoreceptors that exhibit stable residual potential properties after 10,000 copies, and that provide images with "good" image qualities after 50,000 copies. See Tamoto, Table 2 at page 60, examples 32 and 35. The Tamoto photoreceptors comprise an electrically conductive substrate, an intermediate layer, a CGL comprising a titanyl phthalocyanine having an X-ray diffraction spectrum that appears to meet the spectrum according to Figure 13 recited in the instant claim 28 and a polyvinyl butyral binder resin, a CTL formed using toluene, and a particular protective layer.

Comparative examples 3 and 5 and those in the declaration do not exemplify the photoreceptors disclosed by the prior art.

Nor do they appear to provide the results that are the same or similar to those reported to be provided by the photoreceptors in Niimi'633 and Tamoto.

Furthermore, applicants in the response filed on Jul. 12, 2007, page 24, state, "Niimi'633 is similar to Reference examples 1 and 2 of the present application." Applicants state that "[r]eference examples 1 and 2 are comparative examples in view of the concept of the present invention." Reference examples 1 and 2 exemplify photoreceptors that are the same as example 1, but they comprise CTL's made from a halogenated solvent. As noted by applicants, those photoreceptors exhibit good performance. The examiner notes that those photoreceptors exhibit the same or similar results in image quality and potential properties, e.g., photosensitivity, as exhibited by the photoreceptors in examples 2 and 4, which comprise charge transport layers made by the non-halogenated solvent tetrahydrofuran. See amended Table 2 of the instant specification filed on Nov. 13, 2007. Thus, based on applicants' comments, the instant claimed photoreceptor does not appear to provide unexpected results over the prior art.

Thus, because the showings in the instant specification and in the declaration do not appear to compare to Niimi'633 or

Tamoto, it is not clear whether the instantly claimed photoreceptor provides "unexpected" results over the prior art.

Accordingly, for the reasons discussed above and in the rejections in paragraphs 7-13 above, the prior art rejections stand.

15. Claims 33 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2002/0064721 A1 (Ishii) combined with: (1) Chambers; (2) US 5,496,671 (Tamura); (3) Japanese Patent 2000-319538 (JP'538), as evidenced by Ladd et al., Structure Determination by X-ray Diffraction, p. 426 (Ladd), and applicants' admission in synthesis example 1 of the instant specification (applicants' admission II); (4) Ueda, as evidenced by the Sekisui Product Information Sheet; and (5) Hashimoto. See the USPTO English-language translation of JP'538 for cites.

Ishii discloses an electrophotographic photoconductor (also known in the electrophotographic arts as a photoreceptor) comprising a particular aluminum drum, as the electroconductive substrate, an intermediate layer, a charge generation layer, and a charge transport layer. The aluminum cylinder has a 10-point average surface roughness Rz (according to JIS B0601-1994) of 1.3  $\mu\text{m}$ . See paragraph 0035 and example 1 in paragraphs 0101 to 0107. Although example 1 in Ishii comprises an intermediate

layer, Ishii teaches that said layer is optional. See paragraph 0077. In other words, Ishii teaches photoconductors not containing an intermediate layer that meet the "no intermediate layer" limitation recited in instant claim 33.

In example 1 of Ishii, the charge transport layer is obtained by coating the charge generation layer with a coating solution comprising a binder resin, a charge transport compound, and the solvent mixture of monochlorobenzene and dichloroethane. Ishii does not exemplify forming a charge transport layer with a non-halogen solvent as recited in instant claim 33. However, Ishii does not limit the type of charge transport layer used. Paragraphs 0068 and 0069.

It is well known in the electrophotographic arts that the use of chlorinated solvents has environmental safety problems. See Chambers, col. 2, lines 14-21. According to Chambers, chlorinated solvents, such as dichloromethane, dichloroethane, monochlorobenzene, and methylene chloride, provide charge transport layers having good coating quality. However, Chambers discloses that "chlorinated solvents have environmental safety problems . . . the use of these solvents requires solvent abatement systems in order to eliminate leakage. Therefore, non-chlorinated solvent systems that provide coating qualities

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similar to or better than those of chlorinated solvent systems are desired."

Tamura teaches a charge transport layer comprising a charge transport polymer comprising a triarylamine moiety in the side chain of the polymer. The charge transport layer is formed by coating the charge generation layer with a solution comprising the carbon-carbon double bond containing triarylamine compound CTM-3, a carbon-carbon double bond-containing monomer, and toluene, and photo-setting the coating to form the charge transport polymeric layer. CTM-3 at col. 7; synthesis example 1 at col. 42; and example 1 at col. 43, lines 15-26. Toluene is a non-chlorinated solvent, which avoids the environmental safety problems disclosed by Chambers. The Tamura charge transport layer meets the charge transport layer limitations recited in instant claim 33. According to Tamura, an electrophotographic photoconductor comprising its charge transport layer has improved mechanical strength and high photosensitivity and durability. Col. 1, lines 57-60.

It would have been obvious for a person having ordinary skill in the art, in view of the teachings in Ishii, Chambers, and Tamura, to remove the optional intermediate in the photoconductor in example 1 of Ishii and to use the charge transport layer taught by Tamura as the charge transport layer

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in that photoconductor. That person would have had a reasonable expectation of successfully obtaining an electrophotographic photoconductor that has the properties disclosed by Ishii in paragraph 0011 and that has improved mechanical strength and high photosensitivity and durability as taught by Tamura without the use of environmentally problematic chlorinated solvents as taught by Chambers.

In example 1, the charge generation layer comprises 3 parts of a polyvinyl butyral resin and 6.6 parts by weight of a hydroxygallium phthalocyanine as the charge generation material. Ishii requires that the charge generation material be present in an amount of more than 2 parts by weight and not more than 5 parts by weight based on 1 part by weight of binder resin. Paragraph 0012.

Ishii does not exemplify a titanyl phthalocyanine having an X-ray diffraction spectrum according to Figure 13 as recited in instant claim 33. However, Ishii teaches that the charge generation material can equally be an oxytitanium phthalocyanine (also known as a titanyl phthalocyanine) having the chemical structure of formula (6) disclosed in paragraph 0043. Also see paragraph 0038, lines 7-8. The chemical structure of formula (6) meets the compositional limitations of formula (1) recited in instant claim 33.



JP'538 teaches a titanyl phthalocyanine pigment that meets the compositional limitations of the chemical formula recited in instant claim 33 as well as formula (6) of Ishii. Translation, paragraph 0008. The titanyl phthalocyanine pigment has an X-ray diffraction spectrum in which a highest peak is observed at Bragg  $2\theta$  angle of  $27.2^\circ \pm 0.2^\circ$  and a lowest peak at an angle of  $7.3^\circ$ , when a specific X-ray of Cu-K $\alpha$  having a wavelength of 1.514 Å irradiates the titanyl phthalocyanine pigment. Translation, paragraph 0012, and synthesis example 1 in paragraphs 0047-0052 and in Table 1, and Fig. 5. JP'538 teaches that there are no peaks between Bragg angles  $7.4^\circ$  and  $9.4^\circ$ . Translation, paragraph 0012. The diffraction spectrum further has peaks at  $9.5^\circ$ ,  $9.7^\circ$ , and  $23.5^\circ$ , and no peak at  $26.3^\circ$ . See Fig. 5. The locations of the peaks at angles  $9.5^\circ$ ,  $9.7^\circ$ , and  $23.5^\circ$  were determined by measuring the positions of the peaks with a ruler and correlating the positions with the x-axis in Fig. 5. JP'538 further discloses forming a charge generating coating solution by dispersing 10 parts by weight of a polyvinyl butyral binder resin having a 4 mole% acetylation degree and 15 parts by weight of its titanyl phthalocyanine in the solvent methyl ethyl ketone using a ball mill. Translation, paragraph 0058, example 1. JP'538 teaches that the amount of the binder resin can preferably be 10 to 300 parts by weight per

100 parts by weight of its titanyl phthalocyanine. Translation, paragraph 0031. According to JP'538, when its titanyl phthalocyanine pigment is used as the charge generation material in the charge generation layer in a photoreceptor, the resulting photoreceptor has high photosensitivity even after repeated use. The chargeability of the photoreceptor does not decrease and the residual potential does not increase after repeated use. Translation, paragraphs 0006 and 0070.

The JP'538 reported wavelength of 1.514 Å appears to be a typographic error. The Cu-Kα wavelength of 1.514 Å does not appear to exist. It is well known that the Cu-Kα spectra line is a doublet consisting of α1 ( $\lambda = 1.5405$ ) and α2 ( $\lambda = 1.5443$ ). The weighted mean Kα line is 1.542 Å, which is the value normally used in Cu-Kα X-ray diffraction. See Ladd, p. 426. Accordingly, because JP'538 teaches using the X-ray of Cu-Kα and that Cu-Kα is known in the art to have mean wavelength of 1.542 Å, it is reasonable to presume that the X-ray diffraction spectrum disclosed in JP'538 is determined with Cu-Kα having a wavelength of 1.542 Å, as recited in the instant claims. The burden is on applicants to prove otherwise. Fitzgerald, supra.

JP'538 does not disclose that its titanyl phthalocyanine has the X-ray diffraction spectrum according to Figure 13 as recited in instant claim 33. However, the peaks at the Bragg

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angles in the X-ray diffraction spectrum in Fig. 5 of JP'538 are within the scope of the spectrum in Figure 13 recited in instant claim 33. The JP'538 spectrum in Fig. 5 appears to be identical to that shown in Figure 13 of instant claim 33. The differences, if any, between the JP'538 spectrum in Fig. 5 and the spectrum in Figure 13 recited in instant claim 33, appear to be artifacts that may be attributed to how the diffraction spectra were obtained or to data manipulation, e.g., using a smoothing method to remove the noise in the spectrum. The JP'538 titanyl phthalocyanine crystal in the synthesis example 1 is also obtained by process steps that appear to be the same or substantially the same as those used in synthesis example 1 of the instant specification, wherein the resultant titanyl phthalocyanine has an X-ray diffraction spectrum according to Figure 13. Thus, it is reasonable to presume that the JP'538 titanyl phthalocyanine has an X-ray diffraction spectrum that meets the X-ray diffraction spectrum in Figure 13, when a Cu-K $\alpha$  X-ray having a wavelength of 1.542 Å is used, as recited in instant claim 33. The burden is on applicants to prove otherwise. Fitzgerald, supra.

JP'538 does not exemplify a charge generation layer coating solution comprising a polyvinyl acetal as recited in instant claim 33. Nor does JP'538 exemplify a charge generation layer

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coating comprising its titanyl phthalocyanine pigment having an average particle diameter as recited in the instant claims.

However, as discussed supra, JP'538 exemplifies a charge generation layer coating solution obtained by dispersing a polyvinyl butyral binder resin having a 4 mol% acetylation degree and its titanyl phthalocyanine in a solvent using a ball mill. Furthermore, although JP'538 teaches that polyvinylbutyral resins having an acetylation degree of 4 or more mole% are preferred, JP'538 does not exclude the use of other resins as the binder resin in the charge generation layer coating solution, such as other polyvinylbutyral resins. See the translation, paragraph 0031, which lists a number of different resins. Paragraph 0031 further states that "[p]olyvinyl acetal represented by polyvinyl butyral is especially good . . ."

Ueda teaches that it is preferred to use a polyvinyl butyral resin having a polymerization degree of 500 to 2000, a butylation degree of 50-80 mole percent, and an acetylation degree of 0 to 5 mole percent as the binder resin in a charge generation layer. Ueda further teaches that the polyvinyl butyral resin sold under the tradename S-LEC BX-1, manufactured by Sekisui Kagaku Kogyo K.K., meets the requirements of the preferred polyvinyl butyral resin. According to Ueda and the

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Sekisui Product Information Sheet, the polyvinyl butyral resin sold under the tradename S-LEC BX-1 is within the compositional limitations of the polyvinyl acetal resin recited in instant claims 33 and 37. The discussions of Ueda and the Sekisui Product Information Sheet in paragraph 7 above are incorporated herein by reference.

Hashimoto teaches a method of preparing a charge generation dispersion liquid for forming a charge generation layer comprising the step of dispersing a charge generation pigment or dye with a binder resin with a ball-shaped pulverizing media in a dispersing solvent to an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15 or 0.18  $\mu\text{m}$ . The average particle sizes of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15 or 0.18  $\mu\text{m}$ , are within the particle diameter limitation of "not greater than 0.3  $\mu\text{m}$ " recited in instant claim 33. The discussion of Hashimoto in paragraph 7 above is incorporated herein by reference.

When a charge generation dispersion coating solution comprising the JP'538 titanyl phthalocyanine pigment and the commercially available polyvinylbutyral binder resin sold under the tradename S-LEC BX-1 by Sekisui Corp., as taught by Ueda, in the amounts taught by Ishii, is prepared as taught by Hashimoto, such that the resultant dispersion solution comprises titanyl phthalocyanine pigment dispersoids having an average particle

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size of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15 or 0.18  $\mu\text{m}$ , and is then used to form the charge generation in the photoconductor rendered obvious over the combined teachings of Ishii, Chambers, and Tamura, the resultant photoconductor satisfies the surface roughness - particle size relationships recited in instant claim 33. The average particle sizes of 0.15 and 0.18  $\mu\text{m}$  are smaller than the Ishii aluminum cylinder surface roughness  $R_z$  of 1.3  $\mu\text{m}$  and are also not greater than  $2/3$  of the roughness of 1.3  $\mu\text{m}$  (i.e., 0.87  $\mu\text{m}$ ), as recited in instant claim 33.

It would have also been obvious for a person having ordinary skill in the art, in view of the teachings of Ishii, JP'538, Hashimoto, and Ueda, as evidenced by the Sekisui Product Information Sheet, to prepare a charge generation dispersion coating solution as taught by Hashimoto comprising the JP'538 titanyl phthalocyanine pigment and the commercially available polyvinylbutyral binder resin sold under the tradename S-LEC BX-1 by Sekisui Corp., as taught by Ueda, in the amounts taught by Ishii, such that the resultant dispersion solution comprises titanyl phthalocyanine pigment dispersoids having an average particle size of about 0.1 to 0.3  $\mu\text{m}$ , e.g., 0.15 or 0.18  $\mu\text{m}$ . It would have also been obvious to that person to use the resultant dispersion solution to form the charge generation layer in the photoconductor rendered obvious over the combined teachings of

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Ishii, Chambers, and Tamura. That person would have had a reasonable expectation of successfully obtaining an electrophotographic photoconductor that has high photosensitivity and stable charging properties and residual potential properties after repeated use, as taught by JP'538, that has further improved stability and excellent photoconductive properties as taught by Hashimoto, and that further avoids problems, such as bad dispersibility, increment of dark decay of surface potential and deterioration of repeating problems and sensitivity disclosed by Ueda.

Applicants' arguments filed on Dec. 10, 2008, have been considered but are moot in view of the new ground of rejection set forth above.

16. The following rejection is provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

17. Claims 8-10, 15-18, 20-23, 28, and 34 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 4-15, 21, and 22 of copending Application No. 10/656,280 (Application'280), as evidenced by applicants' admission in

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synthesis examples 1 and 8 of the instant specification (applicants' admission III), by that portion of the disclosure in Application'280 that supports the claimed subject matter in claims 1, 4-15, of Application'280, and by the ACS File Registry RN 26201-32-1, in view of Takaya and Ueda, as evidenced by the Sekisui Product Information Sheet.

The rejection is based on the amended claims filed on Feb. 26, 2009, in Application'280.

Reference claim 8, which depends from claim 7, which in turn depends from reference claim 1, recites an image forming apparatus comprising an electrophotographic photoreceptor comprising an electroconductive substrate, a charge generation layer, and a charge transport layer formed on the charge generation layer using the non-halogen solvent of cyclic ethers or aromatic hydrocarbons. The charge transport layer meets the charge transport layer limitations recited in instant claims 16 and 28. The charge generation layer comprises titanyl phthalocyanine crystals having an average primary particle size of less than 0.3  $\mu\text{m}$ , which is within the particle size limitation recited in instant claim 28. The titanyl phthalocyanine crystal has an  $\text{CuK}\alpha$  1.542 Angstrom X-ray diffraction spectrum comprising a maximum peak at a Bragg angle of  $27.2^\circ \pm 0.2^\circ$  and a peak at a lowest Bragg angle of  $7.3^\circ \pm 0.2^\circ$



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and peaks at  $9.4^{\circ} \pm 0.2^{\circ}$ ,  $9.6^{\circ} \pm 0.2^{\circ}$ , and  $24.0^{\circ} \pm 0.2^{\circ}$ . No diffraction peak is observed within a range of from  $7.3^{\circ}$  to  $9.4^{\circ}$  and at a Bragg angle of  $26.3^{\circ}$ .

The claims of Application'280 do not recite that the titanyl phthalocyanine crystal has the chemical structure in formula (1) recited in instant claim 28. Nor do the claims of Application'280 recite that the titanyl phthalocyanine crystal has an X-ray diffraction spectrum according to Figure 13 of the instant specification as recited in instant claim 28. However, as evidenced by the ACS File Registry RN 26201-32-1, it is well known that titanyl phthalocyanine has a chemical structure that is within the limitations of formula (1) recited in instant claim 28, when the indexes m, n, j, and k are 0. The peaks at the Bragg angles in the X-ray diffraction spectrum recited in Application'280 are within the scope of the X-ray diffraction spectrum shown in Figure 13 recited in instant claim 28.

Furthermore, the portion of Application'280 that supports the titanyl phthalocyanine crystal recited in the reference claims teaches that such a titanyl phthalocyanine crystal has an X-ray diffraction spectrum as shown in Fig. 9 of Application'280.

That diffraction spectrum appears to be identical to that shown in Figure 13. See Application'280, synthesis example 1 at pages 84-85, example 1 at pages 93-94, synthesis example 8 at

pages 90-92, and Fig. 9. The differences, if any, between the Application'280 spectrum in Fig. 9 and the spectrum in Figure 13 recited in instant claim 28, appear to be artifacts that may be attributed to how the diffraction spectra were obtained or to data manipulation, e.g., using a smoothing method to remove the noise in the spectrum. The Application'280 titanyl phthalocyanines in synthesis examples 1 and 8 are also obtained by process steps that appear to be the same or substantially the same as those used in synthesis examples 1 and 8 of the instant specification, wherein the resultant titanyl phthalocyanines have an X-ray diffraction spectrum according to Figure 13. When addressing the question of whether a claim in an application defines an obvious variation of an invention claimed in a patent, "those portions of the specification which support the patent claims may be also be examined and considered." See MPEP 804,II.B.1, p. 800-22, citing In re Vogel, 164 USPA 619, 622 (CCPA 1970). Thus, it is reasonable to presume that the titanyl phthalocyanine crystal recited in the reference claims of Application'280 has the chemical structure recited in instant claim 28 and has an X-ray diffraction spectrum as shown in Application'280 Fig. 9 that appears to be identical to that in Figure 13 recited in instant claim 28. The burden is on applicants to prove otherwise. Fitzgerald, supra.

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Reference claim 4, which depends from reference claim 1, requires that the charge transport layer comprise a polycarbonate having, on the main chain and/or side chain thereof, a triarylamine structure, which meets the charge transport polymer limitations recited in instant claim 9. Reference claim 5, which depend from reference claim 1, requires that the photoreceptor further comprise a protective layer that meets the surface protective layer limitations recited in instant claim 10. Reference claim 9, which depends on reference claim 1, requires that the conductive substrate comprise an oxide film formed by anodization. The anodized oxide film meets the substrate limitation recited in instant claim 15.

Reference claims 1 and 11-15 recite that the image forming apparatus further comprises a charging unit, a light-irradiating unit, a developing unit, and a transferring unit that meet the charging, light-irradiating unit, developing unit, and transporting unit limitations recited in instant claims 17 and 20-22. Reference claim 10, which depends on reference claim 1, further requires that the image forming apparatus comprise a plurality of image forming units, thereby meeting the apparatus limitation recited in instant claim 18. Reference claim 15, which depends from reference claim 1, further requires that the apparatus comprise a detachable cartridge comprising

the photoreceptor and a member selected from the group consisting of a charger, an irradiator, and a developer, which meets the unit limitations recited in instant claim 23.

Instant claim 8 is written in product-by-process format. The reference claims do not recite that the titanyl phthalocyanine material is obtained by the method recited in instant claim 8. However, the titanyl phthalocyanine material recited in the claims of Application'280 exhibits an X-ray diffraction spectrum that appears to be identical to the spectrum in Figure 13 recited in instant claim 28, and the particle size limitation of "not greater than 0.3  $\mu\text{m}$ " recited in instant claim 28. Therefore, it appears that the titanyl phthalocyanine material recited in the claims of Application'280 is the same or substantially the same as the instantly recited titanyl phthalocyanine crystal made by the process steps recited in the instant claim. The burden is on applicants to prove otherwise. Marosi; Thorpe; MPEP 2113.

The reference claims do not recite the presence of an intermediate layer located between the electroconductive substrate and the charge generation layer having a surface roughness as recited in the instant claims.

Takaya teaches the benefits of using of a particular intermediate layer located between the charge generation layer

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and the electroconductive substrate of an electrophotographic photosensitive member, which has a 10-point surface roughness  $R_z$  of 0.5  $\mu\text{m}$ . The discussion of Takaya in paragraph 7 above is incorporated herein by reference.

When the Takaya intermediate layer is used in the photoreceptor recited in the reference claims of Application'280, as evidenced by applicants' admission III, by that portion of the disclosure in Application'280 that supports the claimed subject matter in claims of Application'280, and the ACS File Registry RN 26201-32-1, the resultant photoreceptor satisfies the surface roughness - particle size relationships recited in instant claim 28. As discussed supra, the titanyl phthalocyanine crystal particles in the charge generation layer recited in the reference claims of Application'280 have an average primary particle diameter of less than 0.3  $\mu\text{m}$ . The average primary particle diameter of less than 0.3  $\mu\text{m}$  is smaller than the Takaya undercoat layer 10-point surface roughness of 0.5  $\mu\text{m}$  and is also not greater than 2/3 of the roughness of 0.5  $\mu\text{m}$  (i.e., 0.33  $\mu\text{m}$ ), as recited in instant claim 28.

It would have been obvious for a person having ordinary skill in the art, in view of the subject matter recited in the reference claims in Application'280, as evidenced by applicants'

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admission III, by that portion of the disclosure in Application'280 that supports the claimed subject matter in claims of Application'280, and the ACS File Registry RN 26201-32-1, and the teachings in Takaya, to use the intermediate layer taught by Takaya having a 10-point surface roughness  $R_z$  of  $0.5\text{ }\mu\text{m}$  between the electroconductive substrate and the charge generation layer in the photoreceptor recited in the reference claims of Application'280, wherein the titanyl phthalocyanine crystals have an average primary particle size of less than  $0.3\text{ }\mu\text{m}$ , and the charge transport layer is formed from a non-halogen solvent. That person would have had a reasonable expectation of successfully obtaining an electrophotographic photoreceptor, an image forming apparatus, and a process cartridge that prevent the occurrence of interference fringes and exhibit excellent potential characteristics and image forming characteristics free from difficulties over a variety of temperature and humidity environment conditions as disclosed by Takaya.

The reference claims also do not recite that the charge generation layer comprises a polyvinyl acetal binder resin as recited in the instant claims.

Ueda teaches that it is preferred to use a polyvinyl butyral resin having a polymerization degree of 500 to 2000, a

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butylation degree of 50-80 mole percent, and an acetylation degree of 0 to 5 mole percent as the binder resin in a charge generation layer. Ueda further teaches that the polyvinyl butyral resin sold under the tradename S-LEC BX-1, manufactured by Sekisui Kagaku Kogyo K.K., meets the requirements of the preferred polyvinyl butyral resin. According to Ueda and the Sekisui Product Information Sheet, the polyvinyl butyral resin sold under the tradename S-LEC BX-1 is within the compositional limitations of the polyvinyl acetal resin recited in instant claims 28 and 34. The discussions of Ueda and the Sekisui Product Information Sheet in paragraph 7 above are incorporated herein by reference.

It would have been obvious for a person having ordinary skill in the art, in view of subject matter recited in the reference claims of Application'280 and the teachings of Ueda, the Sekisui Product Information Sheet, to use the commercially available polyvinyl butyral resin sold under the tradename S-LEC BX-1 by Sekisui Corp. as the binder resin in the charge generation layer in the photoreceptor rendered obvious over the subject matter recited in the reference claims of Application'280, as evidenced by applicants' admission III, by that portion of the disclosure in Application'280 that supports the claimed subject matter in claims of Application'280, and the

ACS File Registry RN 26201-32-1, combined with the teachings of Takaya. That person would have had a reasonable expectation of successfully obtaining a photoreceptor, an image forming apparatus, and a process cartridge that avoid problems, such as bad dispersibility, increment of dark decay of surface potential and deterioration of repeating problems and sensitivity disclosed by Ueda.

18. Applicants' arguments filed on Dec. 10, 2008, as applicable to the rejections in paragraph 17 above, have been fully considered but they are not persuasive.

Applicants request that the examiner withdraw the provisional rejection over Application'280 if it is the only remaining rejections in the case, referencing MPEP 822.01.

However, the provision rejection is not the only remaining rejections in the case. Moreover, applicants did not traverse the merits of the rejection over copending application'280 set forth in paragraph 17 above. Accordingly, the rejection stands.

19. Claim 36 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.



Claim 39 would be allowable if rewritten to overcome the objection, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Janis L. Dote whose telephone number is (571) 272-1382. The examiner can normally be reached Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry regarding papers not received regarding this communication or earlier communications should be directed to Supervisory Application Examiner Ms. Sandra Sewell, whose telephone number is (571) 272-1047.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Janis L. Dote/  
Primary Examiner, Art Unit 1795

JLD  
Mar. 17, 2009